REMARKS/ARGUMENTS

The Examiner is thanked for the clarity and conciseness of the Office Action and for the citation of the references which have been studied with interest and care.

Claim Rejections - 35 U.S.C. § 101

Claims 1-17 were rejected under 35 U.S.C. 101 because, as asserted in ¶ 4 of the Office Action, "[t]he method recited in claims 1-17 does not result in a physical transformation nor does it provide a tangible result such as displaying an image."

Independent claims 1, 11, 12 and 13 have been amended. It is respectfully submitted that claims 1-17 recite statutory subject matter providing the tangle result of presenting a three-dimensional image, and withdrawal of this rejection is requested.

Claim Rejections - 35 U.S.C. § 102

Claims 18-26 were rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 5,929,859 to Meijers.

Meijers discloses an image processing system for generating at least one output image related to an image input through a parallactic transformation.

For the Examiner's convenience, claim 18 is presented below:

> 18. (currently amended) A method for providing ~~a three-dimensional image~~ depth accurate three-dimensional images converted from two-dimensional images, comprising:
>
> scaling down higher resolution images to generate lower resolution images;
>
> processing the lower resolution images to determine three-dimensional conversion information; and
>
> applying the three-dimensional conversion information to the higher resolution images to create three-dimensional images.

Miejers discloses a form of "pre-processing" that involves storing a plurality of successive pixels before the processor processes the pixels:

> Preferably, the depth converter converts and stores a plurality of successive pixels before the processor processes the pixels. Advantageously, such plurality includes all pixels of the image, all pixels of a line of the image or an amount of pixels corresponding to a maximum pixel shift (e.g. if a pixel can be shifted over a maximum of 16 pixel positions, at least 16 pixels are processed by the depth converter, before being processed by the processor).

> An embodiment of the system, according to the invention wherein the pixel shift is limited to a predetermined maximum of N pixel positions, is characterised in that the processor comprises a sliding buffer with at least N locations for storing pixel values and in that the processor is operative to process successive input pixels; said processing comprising:
>
> copying the respective input pixel value from the memory into the sliding buffer at a location with an offset depending on the corresponding input pixel shift,
>
> outputting an output pixel value by reading a pixel value from an output location in the sliding buffer, and
>
> shifting the sliding buffer.
>
> The pixels of the output image are created using only a small sliding buffer without requiring to store the output image. This also simplifies the operation of the processor, contributing to a fast and cost-effective implementation of the processor.

[Meijers, column 3, lines 8-32.]

Meijers does not disclose or suggest scaling down higher resolution images to generate lower resolution images. Rather, Meijers teaches using a sliding buffer approach whereby a sub window of successive pixels (e.g., 16 pixels) is processed by the depth converter, before being processed by the processor. With respect to processing, Meijers essentially teaches "eating the cow" in smaller bites, not processing a lower resolution image of the cow. Meijers does not include the word "resolution".

Claim 25 has been amended as follows:

> 25. (currently amended) A method for providing ~~a three-dimensional image~~ depth accurate three-dimensional images converted from two-dimensional images, comprising:
>
> receiving or accessing image data created by scaling ~~depth and/or~~ hidden surface area reconstruction information associated with a three-dimensional image ~~to preserve~~ converted from a two-dimensional image to control exaggerated depth effects caused by changes to the size of the three-dimensional image by preserving perceived depths of objects or other image components within the three-dimensional image when the three-dimensional image is presented at a particular screen size, multiple screen sizes, or within a particular range of screen sizes; and
>
> using the image data to reproduce a three-dimensional image.

With regard to hole artifacts, Miejers discloses:

> In contrast to different pixels of the input image being shifted to the same output pixel position, FIG. 4 shows an example wherein a 'hole' occurs in the output image 430 due to the fact that no input pixel is present to fill a position in the output image 430. FIG. 4A shows that in the input image 420 a background object 410 is at least partly obscured by a foreground 400. In FIG. 4B no overlap (or a smaller overlap) occurs between the objects 400 and 410 as represented in the output image 430, observed from the observation point O_2. Such hole artifacts can be removed by substituting a pixel value obtained through interpolation of the horizontally neighbouring pixel values that are available left and right of the hole. As a simple alternative, the value is substituted of the available neighbouring pixel with the greatest z-value. Such a substitution matches real life experience when the observer watches a background object emerging from behind a foreground object.

[Meijers, column 9, lines 22-38.]

Meijers addresses the problem of hole artifacts that occur in the output image *resulting from pixels in the input image being shifted* by "substituting a pixel value obtained through interpolation of the horizontally neighbouring pixel values that are available left and right of the hole" or substituting "the available neighbouring pixel with the greatest z-value." Meijers does not disclose or suggest scaling the substituted pixels values. Meijers only addresses the problem of hole artifacts *after* the input image has been shifted, and the Meijers solution does not involve scaling of hidden surface area reconstruction information as claimed by Applicants.

For the reasons discussed above, Meijers fails to disclose or suggest claims 18-26. Withdrawal of this rejection is respectfully requested.

Claim Rejections - 35 U.S.C. § 103

Claims 1-3, 5-8, 10-14 and 16 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,929,859 to Meijers in view of U.S. Patent No. 6,765,568 to Swift et al.

Swift et al. discloses an electronic stereoscopic media delivery system that "provides automatic and manual optimization adjustments such as parallax shift adjustment, brightness control, color adjustment, and cross-talk reduction to the stereoscopic media based on viewing hardware, monitor size, and media content for optimal viewing quality." [Swift et al., column 2, lines 36-42.]

In an example embodiment (referring to FIG. 10 of Applicants' Specification), the conversion workstation 1004 is also configured to allow the user to specify an output screen size or range of output screen sizes, so that perceived depths of objects or other components within the three-dimensional image will be preserved when the three-dimensional image is presented at the specified screen size or range of screen sizes. By way of example, a user selected choice of output screen size formatted files 1005 is provided as an input to the process for providing 3D images 1000. Example ranges of output screen sizes include, but are not limited to: 12-65 inch screen sizes, 18-35 foot screen sizes, 40-60 foot screen sizes, and 80-100 foot screen sizes. In various embodiments, the user can specify any screen size, multiple screen sizes, or a range of screen sizes. As shown in this example, the user selected choice of output screen size formatted files 1005 is provided as an input to processing steps 1007 and 1008 for scaling of depth values of hidden surface reconstructions, respectively. Once the 2D-to-3D conversion process 1002 is complete, a user specified output screen size (such as an 80-100 foot large venue screen size) is used at step 1007 to scale the depth values employed at the process step 1003 to create the alternate perspective frames so that the focal point distances will match that large screen size. The specified output screen size is also used at step 1008 to provide scaling for a step 1009 during which hidden surface reconstruction processing (discussed above) is performed. In one embodiment, hidden surface reconstruction information is scaled depending upon the specified output screen size.

Swift et al. does not: include the word "range", suggest selecting a range of screen sizes, or suggest scaling depth information to accommodate a range of screen sizes.

Applicants respectfully submit that, in Swift et al., the parallax shift adjustment based on monitor size does not constitute disclosure or suggestion of (as recited in amended Claim 1) "selecting a range of screen sizes for a three-dimensional image converted from a two-dimensional image to be reproduced on; scaling depth information associated with objects in the three-dimensional image to control exaggerated depth effects caused by changes to the size of the three-dimensional image by preserving perceived depths of the objects when the three-dimensional image is presented within the range of screen sizes selected; and using the depth information to present the three-dimensional image." Claim 11 recites similar distinguishing limitations.

Claims 6, 12 and 13 are readily distinguishable from the collective teachings of Meijers and Swift et al. as neither reference pertains to scaling hidden surface reconstruction information.

For the reasons discussed above, Meijers and Swift et al. fail to disclose or suggest claims 1-3, 5, 7, 8, 10-14 and 16. Withdrawal of this rejection is respectfully requested.

Claims 4, 9, 15 and 17 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,929,859 to Meijers in view of U.S. Patent No. 6,765,568 to Swift et al. in view of U.S. Patent No. 6,535,233 to Smith.

Smith discloses a method and apparatus for adjusting the display scale of an image, calculated to be inversely proportional to the mouse velocity. [Smith, column 2, lines 48-54.]

Smith does not pertain to providing a three-dimensional image. Nor does Smith disclose or suggest selecting a range of screen sizes, or scaling depth information to accommodate a range of screen sizes.

It is respectfully submitted that Smith is not analogous art. Even if it is ultimately determined that Meijers and Swift et al. were properly combined with Smith, claims 4, 9, 15 and 17 are allowable for the reasons discussed above. Withdrawal of this rejection is respectfully requested.

Claims 31-39 and 44-47 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,929,859 to Meijers in view of U.S. Patent No. 5,973,831 to Kleinberger et al.

Kleinberger et al. discloses systems for three-dimensional viewing using light polarizing layers. The Kleinberger et al. system, with its light polarizing layers, employs a 3D viewing technology that has nothing to do with scaling depth and/or hidden surface area reconstruction information, or even with the use of image data. Moreover, there is no disclosure or suggestion in Meijers that it would be desirable to look to the teachings of Kleinberger et al. to enhance the Meijers image processing system. For these reasons, withdrawal of this rejection is respectfully requested.

Claims 37, 38 and 41-43 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,929,859 to Meijers in view of U.S. Patent No. 6,198,484 to Kameyama.

Kameyama discloses a stereoscopic display system.

> The system has a stereoscopic condition calculating section. This section comprises: an out-of-field data exclude means 12 that excludes data on a model present outside the field of view; a gaze range determination means 13 that estimates a gaze range (including a gaze point) over which the left and right eyes are fixed on the basis of model data; a model move means 14 that performs a process of moving the model in the direction of depth; a model enlarge/reduce means 15 that performs a process of enlarging or reducing the model; a depth distance reduce means 16 that sets up the scale of the model space in the direction of depth so that the main portion of the model will be included in the easiness-of-stereoscopy region; a tone change means 17 that changes the tone of the model to impart to the displayed image an effect of seeing objects through air; a coordinate system transform means 18 that performs a process of putting a model placed in the coordinate system of three-dimensional space into the coordinate system for the stereoscopic display system (stereoscopic coordinate system); an image offset adjust means 22 that adjusts the offset amount of the right and left images to eye fatigue; and an image edge process means 23 that performs a process of shading-off/blurring the edges of the display screen.

[Kameyama, column 9, lines 45-67 (emphasis added).] Kameyama does not disclose or suggest receiving or accessing image data created by scaling depth and hidden surface area reconstruction information. Claim 37 has been amended consistent for the foregoing remarks. For the reasons discussed above, withdrawal of this rejection is respectfully requested.

Claims 51 and 52 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,929,859 to Meijers in view of U.S. Patent No. 6,496,598 to Harman.

Harman discloses an image processing method and apparatus. Harmon discloses a "Module 2", an image analysis process that includes the steps of: image compression, motion detection, object detection, and motion analysis. [Harmon, column 8, line 7 - column 11, line 9.] Harmon does not disclose or suggest receiving or accessing image data created by scaling depth and hidden surface area reconstruction information. Claim 51 has been amended consistent with the foregoing remarks. For the reasons discussed above, withdrawal of this rejection is respectfully requested.

Claims 37, 40 and 48-50 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,929,859 to Meijers in view of U.S. Patent No. 5,495,576 to Ritchey.

Ritchey discloses a panoramic image based virtual reality/telepresence audio-visual system and method. Ritchey does not pertain to hidden surface area reconstruction, and certainly

does not disclose or suggest receiving or accessing image data created by scaling depth and hidden surface area reconstruction information. Claims 37 and 49 have been amended consistent with the foregoing remarks. For the reasons discussed above, withdrawal of this rejection is respectfully requested.

Claims 27-30 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,929,859 to Meijers in view of U.S. Patent No. 5,481,321 to Lipton.

Lipton discloses a stereoscopic motion picture projection system. The Lipton system, with its polarization control means for controlling a polarization characteristic of light, employs a technology that has nothing to do with scaling depth and/or hidden surface area reconstruction information, or even with the use of image data. Moreover, there is no disclosure or suggestion in Meijers that it would be desirable to look to the teachings of Lipton to enhance the Meijers image processing system.

Claim 28 has been amended consistent with other claims previously discussed. A key distinguishing point between Applicants' claims and Meijers is that this reference does not disclose or suggest controlling exaggerated depth effects caused by changes to the size of the three-dimensional images by preserving perceived depths of objects or other image components within the three-dimensional images when the three-dimensional images are presented at a particular screen size, multiple screen sizes, or within a particular range of screen sizes. In particular, Meijers does not address image manipulation to accommodate changes to the size of three-dimensional images.

In contrast with the collective teachings of the cited references, Applicants claim a method for providing depth accurate three-dimensional images converted from two-dimensional images that addresses problems associated with presenting three-dimensional images on different sized screens. For these reasons, withdrawal of this rejection is respectfully requested.

For the reasons discussed above, withdrawal of these rejections is respectfully requested.

Notice of References Cited

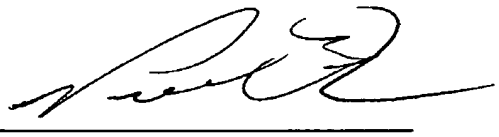
Applicants request that the Examiner amend the Notice of References Cited (PTO-892) to add U.S. Patent No. 6,198,484 to Kameyama, which was not listed in the notice.

CONCLUDING REMARKS

Applicants submit that the application is in condition for allowance. Concurrence by the Examiner and early passage of the application to issue are respectfully requested.

Any additional fees which are required in connection with this communication and which are not specifically provided for herewith are authorized to be charged to deposit account no. 500651. Any overpayments are also authorized to be credited to this account.

Respectfully submitted,



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